AMENDMENT(S) TO THE CLAIMS:

The following listing of claims will replace all prior versions, and listings, of claims on the application. All claims are set forth below with one of the following annotations.

- (Original): Claim filed with the application.
- (Currently amended): Claim being amended in the current amendment paper.
- (Canceled): Claim cancelled or deleted from the application. No claim text is shown.
- (Withdrawn): Claim still in the application, but in a non-elected status.
- (New): Claim being added in the current amendment paper.
- (Previously presented): Claim added or amended in an earlier amendment paper.
- (Not entered): Claim presented in a previous amendment, but not entered or whose entry status unknown. No claim text is shown.

1. (Previously presented) An apparatus to maintain a voltage-controlled oscillator (VCO) close to a desired operating point, the voltage-controlled oscillator (VCO) providing a variable frequency output that depends, in part on an analog control input signal, and in part on a capacitance connected to a capacitor input, the apparatus comprising:

a switchable bank of capacitors connected to said capacitor input and having a switch input to provide a selectable range of operating frequencies for the VCO;

a sensor connected to the control input of the VCO providing a measurement that varies as the magnitude of the control signal, said sensor having more than two output values that vary as the magnitude of the control signal; and

a controller connected to the switch input and accepting the control signal magnitude indication, the controller providing control to the

switchable capacitor bank to maintain the operating point of the VCO close to the desirable operating point.

2. (Previously presented) A monolithic integrated circuit (IC) comprising:

a VCO having a control voltage input and a range capacitor input;

a frequency range controller having a range control input and including a bank of capacitors connected to the VCO range capacitor input;

a sensor connected to the control voltage input to provide a measurement that varies as the control voltage input, said sensor having more than two output values that vary as the magnitude of the control signal; and

a controller connected to the sensor accepting the control voltage indication and providing a control output to the range control input such that the VCO operates close to a desired operating point.

3. (Original) An IC as recited in claim 2, wherein the IC is fabricated using a metal oxide semiconductor process.

4. (Original) The IC of claim 2, further comprising:

a calibrator to calibrate the range control input of the frequency range controller to the VCO frequency.

5. (Previously presented) A frequency synthesizer comprising:

a phase locked loop including

a signal controlled oscillator (SCO),

a programmable frequency divider for dividing a signal from the SCO,

a first controller to provide the divide ratio to said programmable divider,

a reference source,

a phase detector for comparing a signal from said reference source with an output signal of said divider and generating a phase detector signal related to the phase difference therebetween, and

a loop filter for filtering the phase detector signal and providing a SCO control signal for controlling the frequency of said SCO;

a frequency range controller coupled to the SCO that includes switchable elements, each providing a different frequency range of operation of the SCO under control of a switch input;

a calibrator to relate the switch input to frequency ranges;

a sensor coupled to the control signal of the SCO providing a measurement that varies as the magnitude of the control signal, said sensor having more than two output values that vary as the magnitude of the control signal; and

a second controller accepting the magnitude indication and having an output coupled to the switch input of the range controller to maintain the operating point of the SCO close to a desired operating point.

6. (Previously presented) A method for operating a frequency synthesizer that depends on a voltage controlled oscillator (VCO) with an operating frequency range that depends on the setting of a selectable bank of capacitors and on a control input, the method comprising the steps of:

sensing the VCO input to provide a measurement that varies as the magnitude of the control input, the sensing providing more than two values that vary as the magnitude of the control input; and

responding to a request to control the operating point by changing to a Previously presented operating frequency range based on the measured control

input, the changing actuated by providing a setting of the selectable bank of capacitors

such that the operating point of the VCO is maintained close to a desired operating point.

7. (Original) The method of claim 6, further including the step of:

calibrating the frequency synthesizer from time to time to generate a mapping of the settings of the selectable bank to frequency ranges.

8. (Previously presented) An apparatus comprising:

a sensor to sense the operating point of a VCO in a PLL configuration by providing a measurement that varies as the input control voltage of the VCO, said sensor having more than two output values that vary as the input control voltage; and

a controller that provides a switching input to a switchable bank of capacitors connected to the VCO to change the operating point such the the VCO is maintained close to a desired operating point.

9. (Original) An apparatus as recited in claim 8, wherein the switching input is determined according to calibration data obtained by a calibration method.

10. (Previously presented) An apparatus to maintain a voltage-controlled oscillator (VCO) close to a desired operating point, the voltage-controlled oscillator (VCO) providing a variable frequency output that depends, in part on an analog control input signal, and in part on a capacitance connected to a capacitor input, the apparatus comprising:

means for switching a bank of capacitors connected to said capacitor input to provide a selectable range of operating frequencies for the VCO, the means for switching having a switch input;

means for sensing to provide a measurement that varies as the magnitude of the control signal, the means for sensing connected to the control input of the VCO, the means for sensing having more that two output values that vary as the magnitude of the control signal; and

means for controlling the bank of capacitors to maintain the operating point of the VCO close to the desirable operating point, the means for controlling connected to the switch input and accepting the measurement that varies as the magnitude of the control signal.

11. (Previously presented) A monolithic integrated circuit (IC) comprising:

a VCO having a control voltage input and a range capacitor input;

means for controlling the capacitance connected to the VCO range capacitor input, the means for controlling having a range control input;

means for sensing the control voltage input, the means for sensing connected to the control voltage input and having an output of more than two possible values that vary as the control voltage input; and

means for controlling the VCO frequency such that the VCO operates close to a desired operating point, the means for controlling connected to the sensing means and accepting the sensed control voltage input and providing a control output to the range control input.

12. (Original) The IC of claim 2, further comprising:

means for calibrating the range control input to the VCO frequency.

13. (Previously presented) A frequency synthesizer comprising:

a phase locked loop including

a signal controlled oscillator (SCO),

means for dividing the frequency of a signal from the SCO,

first control means for providing the divide ratio to said programmable divider,

means for providing a reference source,

means for comparing a signal from said reference source with an output signal of said means for dividing and for generating a phase detector signal related to the phase difference therebetween, and

means for filtering the phase detector signal and providing a SCO control signal for controlling the frequency of said SCO;

means for controlling a frequency range, the frequency range controlling means coupled to the SCO that includes switchable elements, each providing a different frequency range of operation of the SCO under control of a switch input;

means for calibrating by relating the switch input to frequency ranges;

means for sensing coupled to the control signal of the SCO , the means for sensing providing an output of more than two values that vary as the magnitude of the control signal; and

means for maintaining operating point of the SCO close to a desired operating point, the means for maintaining accepting the output of the means for sensing and having an output coupled to the switch input of the frequency range controlling means.

14. (Previously presented) An apparatus operating a frequency synthesizer that depends on a voltage controlled oscillator (VCO) with an operating frequency range that depends on the setting of a selectable bank of capacitors and on a control input, the apparatus comprising:

means for sensing the VCO input to provide a measurement that varies as the magnitude of the control input, the means for sensing having more than two possible output values; and

means for responding to a request to control the operating point by changing to a Previously presented operating frequency range based on the provided measurement, the changing actuated by providing a setting of the selectable bank of capacitors

such that the operating point of the VCO is maintained close to a desired operating point.

15. (Previously presented) The apparatus of claim 14, further including:

means for calibrating the frequency synthesizer from time to time to generate a mapping of the settings of the selectable bank to frequency ranges.

16. (Previously presented) An apparatus comprising:

means for sensing the operating point of a VCO in a PLL configuration by providing a measurement that varies as the input control voltage of the VCO, said means for sensing having more than two output values that vary as the input control voltage; and

means for controlling that provides a switching input to a switchable bank of capacitors connected to the VCO to change the operating point such that the VCO is maintained close to a desired operating point.

17. (Previously presented) An apparatus as recited in claim 16, wherein the switching input is determined according to calibration data obtained by a calibration method.

18. (Previously presented) An apparatus to maintain a voltage-controlled oscillator (VCO) close to a desired operating point, the voltage-controlled oscillator (VCO) providing a variable frequency output that depends, in part on an analog control

input signal, and in part on a capacitance connected to a capacitor input, the apparatus comprising:

a switchable bank of capacitors connected to said capacitor input and having a switch input to provide a selectable range of operating frequencies for the VCO;

a sensor connected to the control input of the VCO providing a measurement that varies as the magnitude of the control signal, the sensor providing an analog output; and

a digital controller connected to the switch input and accepting the control signal magnitude indication, the controller accepting a digital input and providing control to the switchable capacitor bank to maintain the operating point of the VCO close to the desirable operating point;

a temperature sensor to provide an indication of temperature to the digital controller; and

an analog to digital converter (ADC) to convert the analog sensor output to the magnitude indication accepted by the digital controller.

wherein the digital controller detects when the temperature changes by more than a temperature threshold and generates the control to the switchable capacitor bank when the temperature threshold is exceeded.

19. (Currently amended) An apparatus as recited in claim 1, wherein said ~~sensor is~~ sensor includes a sense amplifier coupled to an analog to digital converter to provide a multi-bit digital signal.